

This paper should be cited as:

S. Ozawa and N. Warnajith, "Knowledge Sharing for Research and Education by Modern Web and Database Techniques," in *Postępy e-edukacji*, L. Banachowski, Ed. Warszawa: Wydawnictwo PJJWSTK, 2013, pp. 203–218.

Rozdział 13

Knowledge Sharing for Research and Education by Modern Web and Database Techniques

*Satoru Ozawa
Nalin Warnajith*

Graduate School of Science and Engineering, Ibaraki University
Hitachi 316-8511, Ibaraki, Japan

This chapter describes present status of education in some developing countries in Asia Pacific region. Considerable amount of their energy is now being installed to improve their teaching method and E-learning is quite popular in this region. But the quality of E-learning is still low because the teachers do not have enough skill to produce high quality materials for E-learning. In order to level up the teachers' skill to produce good E-learning contents, knowledge sharing system, KISSEL (Knowledge Integration Servers System for E-learning) is proposed. This paper describes the function of KISSEL and some examples of teacher's cooperation based on this system.

1. Introduction

In the last decade, the development of industrial and economic development in Asia Pacific countries is quite remarkable. One of the important factors to develop countries is, of course, "education". Without good quality workers, they cannot set up modern industries. The high quality workers are still lacking in this region. They are trying to increase the capacity and quality of higher education. (By the term 'higher education', we mean university-level and college-level education.) The key for this is ICT. In this paper, E-learning is discussed from the view point of developing countries in Asia Pacific region. Why E-learning is needed and why E-learning is popular in this region is explained. They have installed considerable amount of energy for introducing E-learning methods into higher education but they still have various kind of problems. This paper summarizes these problems and proposes one method for the solution. The idea is "helping each other by sharing knowledge, experience, data and technique between teachers of developing countries" in order to realize better education environments.

The work of academic staffs of university is research and education. The good balancing of the two is important because the both level up the quality of university education. In some developing countries, however, most of the teachers work only for education and their teaching method is still traditional. In order to prepare modern working environment for academic staffs of university, we noted ICT techniques and

started KISSEL project1-8,11. KISSEL stands for “Knowledge Integration Servers System for E-learning”. The KISSEL servers have been installed in some Asia Pacific countries (Japan, Vietnam, Bangladeshi, Sri Lanka, and Samoa) and also in Poland. Various knowledge and techniques which help the activities of academic staffs of universities are being accumulating in the KISSEL servers. This paper is concerned with descriptions of the KISSEL system and the present status of the project in relation to the E-learning environment in the developing countries.

2. Examples of E-learning in Asia Pacific Countries

In this section, let us see how the E-learning method is used in Asia Pacific countries in some typical examples of the higher education. The examples are collected from Samoa, Sri Lanka and Bangladesh.

2.1. E-learning in Samoa

There are thousands of islands in the Pacific Ocean. There are strong demands for higher educations in this region. The problem is how to educate people who are distributed on thousands of separate islands. The E-learning method provides a way of distance education. Here, the E-learning is noted mainly for this character. In this region, there are some important universities such as the University of Hawaii (USA), the University of South Pacific (Fiji), etc. These universities work as *hub* universities. The hub universities have remote campuses on the other islands.



Figure 13.1. An E-learning classroom building and **parabolic antennas** for microwave satellite connection in Alafua Campus in Samoa (Left), the University of South Pacific, Fiji; and E-learning session (Right) at Alafua Campus in Samoa broadcasted from the main campus of the University of South Pacific, Fiji.

Figure 13.1 shows an example of a satellite E-learning in Samoa broadcasted from the University of South Pacific in Fiji. They use a microwave satellite connection system for the distance education. Prior to the E-learning session, the textbooks are distributed to the students. The lecturer’s voice and the image of teaching material are transmitted through the microwave. One or two network specialists take care of the E-learning class session. The teaching material are text-based documents. The multimedia-type E-learning is not carried out yet because of the narrow bandwidth of the microwave

satellite connection. In the Pacific Ocean, the main submarine optical fiber cables are settled between Japan and USA. Some of them directly connect the two countries and the others connect via Hawaii. There are some other submarine stem cables which connect USA and New Zealand or Australia via Hawaii and Fiji. Nowadays, branch cables are growing from the stem lines of the submarine cables. The microwave connections are gradually being replaced by the optical fiber connections of which bandwidth is 10~1000 times larger than that of the microwave connections. The bandwidth of the Internet connection will be improved so that the multimedia type E-learning is possible. The E-learning in this region will be improved in near future.

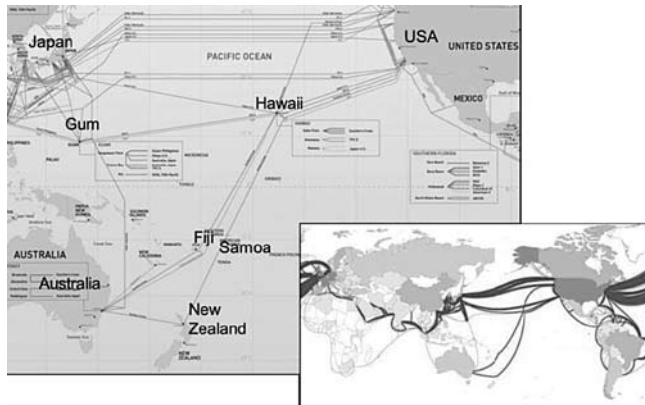


Figure 13.2. Distribution of submarine optical fiber cables in the Pacific Ocean.

2.2. E-learning in Sri Lanka

There are 15 state universities in Sri Lanka. They depend on funds given by the UGC (University Grants Commission) which is subordinate to the Ministry of Higher Education. The fund of UGC is their primary (sometimes only) source of income since the tuition fee is not charged on the students in Sri Lankan state universities. Thus the UGC has a direct and strict control over the state universities. There are a few non-UGC universities which are under the umbrella of the other ministry, and some private institutes; most of them are foreign origin. As a whole, the university education in Sri Lanka is strictly controlled by the government until now. They have an entrance examination system which is commonly applied to all Sri Lankan universities. The quality of applicants is estimated by the so called "Z-score" of three basic subjects. They decide students who are qualified to receive university-level education on the basis of the Z-score. But, unfortunately the number of the "qualified students" is much larger than the total number of capacities of the 15 state universities. Therefore, actual admissions to the universities are about 20% of the qualified students. In Sri Lanka, E-learning method is noted because it can enlarge effectively the capacity of university and gives more opportunities of university education to the qualified students. For this reason, some higher education institutes in Sri Lanka have already introduced E-learning courses in some selected subjects. These courses adopt 50% E-learning method and 50% traditional method. The course materials of the

E-learning are given in the form of Power Point slides and text-based documents. The teachers publish their assignments for the students through the Internet. The students submit their assignments by e-mails. It should be noted that all students finish the E-learning courses without any dropouts and the results of assignments are better in the E-learning courses than in the normal courses. E-learning is accepted by the people as an attractive mode of teaching or learning. This feeling that the E-learning is much smarter than the traditional education method is commonly seen in Asia Pacific countries. This is quite in contrast to the fact that, in developed countries, they consider human relationship between teachers and learners is the most important factor in education. Figure 13.3 illustrates the feeling of Asia Pacific people about the E-learning.



Figure 13.3. By comparing these pictures, we can understand Asian people's feeling about the E-learning. They accept it as a smart and attractive method of teaching and learning.

2.3. E-learning in Bangladesh

There are 33 state universities, 56 private universities, and 2 international universities in Bangladesh. There is one 100% E-learning university which is called "Open University". About 50% of the universities are in Dhaka area. Some of them have remote campuses in local cities. The 12 state university and 33 private universities were established in the last 15 years. This is because they had quite rapid increase of demands for higher education in these years. Higher education in Bangladesh has much more freedom than that in Sri Lanka where it is strictly controlled by the government via UGC. Roughly speaking, in Sri Lanka, higher education is a governmental matter, while, in Bangladesh, they depend higher education also on private university. The private university provides some degree-granting programs approved by UGC and also non-degree-granting programs. The private university is a kind of business in Bangladesh. Usually the tuition fee of the private universities is very expensive. A new university style has appeared in Dhaka in recent years. The most of the newly born private universities do not have large campuses. One building on the city street can be a university (see Figure 13.4). The E-learning method is more noted in such newly born private universities rather than in the traditional state universities. The E-learning method is considered as a business tool. It produces an attractive character of university and it enables efficient management of remote campuses which are in the suburbs of Dhaka or in local cities.



Figure 13.4. A newly born private university has no campus. Just a building (Left) is standing on a city street, where students enjoy their “campus” life (Right).

3. Problems in E-learning in developing countries

In the previous section, we have seen some examples of higher education in Asia Pacific countries. The phenomenon commonly seen in these examples is the quite rapid increase of demands for higher education. This is a nice thing for the countries because the production of well-educated people is the starting point of modernizations of industries. In the developing countries, the people consider that the E-learning can be an efficient education system. Actually, the implementation of E-learning method produces some good results as seen in the previous section. On the other hand, they do have problems, too. The problems are classified into (1) the infrastructure based thing and (2) the human based things.

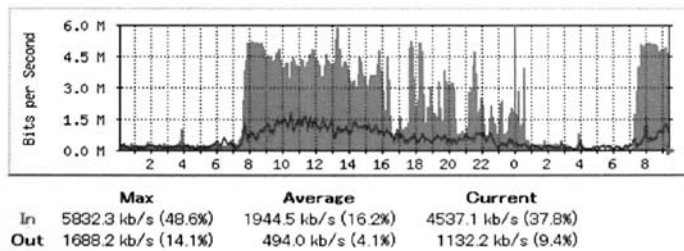
3.1. Infrastructure based problems

Despite of the huge demand of using computers for education in these countries, the capacity of the network is not enough. The increasing rate of the demand is always much larger than the speed of improvement of the infrastructure. Figure 13.5 shows an example of usage of network in the Open University in Sri Lanka. The time scale is shown in Sri Lankan local time (GMT + 5:30). Theoretically the maximum speed allocated to this university is 10Mbps, however, because of practical limitations, only 60% of the theoretical value is actually available. Namely actual bandwidth is about 6Mbps. It is seen from the figure that the bandwidth is fully used in office hours but in midnight there exit time periods in which there are few users of the network. (Note the Open University is a special E-learning university in Sri Lanka. The network of this university is used even on Saturday and Sunday. In normal universities, the network is not so busy on weekends.) In such situation of the bandwidth, it is impossible to carry out, in office hours, multimedia-type E-learning which consumes large amount of bandwidth. It is also seen from the figure that amount of the data input from the outside of university is less than that of the data output. This is because useful data is not enough inside the university.

Beside the bandwidth problem¹², they have many infrastructure based problems⁸. The cost of hardware and software is too much expensive as compared with the total

income of the university. Therefore, the E-learning equipment is not fully installed and there are many students waiting in front of the computers for their turn. Even teachers make queues for using computers to produce their teaching materials. The software and hardware are not suitably updated because of their limited budget. They sometimes cannot afford to pay attention to anti-virus software and their system is often contaminated by computer virus. This gives bad effect on the performance of the computer and the network. The most of the students do not have computer at home. The Internet access is available only in limited area of the countries. In Sri Lanka, for example, only 4% of the households have computers. The computer users are less than 10% even in the western province which has major towns and cities of Sri Lanka. These infrastructure based problems are gradually improving. But the infrastructure based limitations always exist to some extent in anywhere and anytime. The point is how to realize better E-learning system within the limitations.

‘Daily’ Graph (5 Minute Average)



‘Weekly’ Graph (30 Minute Average)

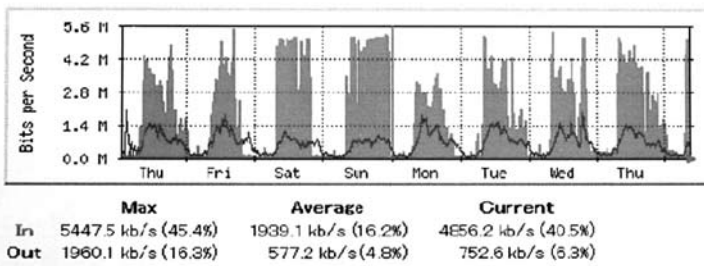


Figure 13.5. Time variation of network usage at the Open University in Sri Lanka, 2012. The percentage usage shows the ratio of the usage against the theoretical bandwidth. The practical bandwidth is about 6MB. So, the bandwidth is fully used in daytime. The bar graph is for the data input and the line graph for the data output.

3.2. Human based problems

The teaching material used for E-learning in the developing countries is sometimes just a copy of normal book. This is because the teachers do not have enough skills to develop more attractive teaching materials which are suited for E-learning. Multimedia type^{7,9,10} and interactive type¹³ teaching materials are much better than the copy of nor-

mal book. Here, the “interactive” means such contents that include sequence of many links. When students click the links, additional information is given to them step by step. If the teaching material is just a copy of normal book, there is almost no merit by giving it through computer. E-learning is a kind of machinery learning. It must have some other merits which can be realized only by machine. The point is how to elevate the teacher’s skill to produce such better teaching materials which are best suited for E-learning. The teachers in the developing countries are usually very busy and they do not have opportunity to get modern multimedia and computer techniques.

Another serious problem in the developing countries is that the most of academic staffs of the university work only for teaching. In the developed countries, research activity is important as well as education activity. The both are interrelated or integrated. In higher education, to teach how to design/produce new things is much more important than to teach already established things. This is carried out only when the teachers are always concerned with research works. One of our problems is how to lead teachers into research works.

4. Proposal of a solution for the problem

As seen in the previous section, our question is how to realize the best suited E-learning in the developing countries within the infrastructural limitations. The points are (1) to elevate teachers’ skill to produce attractive and efficient teaching materials, (2) to look for the way to improve quality of E-learning and (3) to lead teachers to research works and change the education from the knowledge based type to the research based type. Our idea for the solution is to have teachers’ community over the Internet in order to share knowledge, technique and experiences on research and education in Asia Pacific countries. The reason why the target area is restricted to Asia Pacific countries is that the degree of the development of ICT infrastructure and also the E-learning environment are similar in these countries and the knowledge to be shared is similar in character.

Nowadays, there are so many platforms over the Internet which present “social networking services (SNS)”^{5,14}. It is one idea to use such ready-made platforms for our purpose. This paper, however, presents a better platform which is specialized for our purpose. It is called Knowledge Integration Servers System for E-learning (KISSEL). KISSEL project is now being in progress. The aim of the project is to encourage teachers in Asia Pacific countries to set up communities of E-learning among themselves and to share their knowledge, technique and experiences between the members of the communities. The project is a helping each other system and is basically volunteer activity, even though it is supported by funds of Japanese government, JSPS.

4.1. Knowledge sharing by KISSEL servers

The KISSEL servers have already been settled in Japan, Samoa, Sri Lanka, Bangladesh, Vietnam and Poland. The server will be installed also in Indonesia, New Zea-

land etc., in near future. Figure 13.6 shows an example of data sharing between the teachers' community in Samoa and that in Japan. The content of KISSEL server is divided into two parts. One is the international sector where the English is used as the common language, and the other is the local sector where the contents are expressed in their native language. Only the contents in the international sector are copied each other between KISSEL servers by the mirroring function of the servers. The details of this function have been described elsewhere¹⁻⁴. The each KISSEL server of the country is managed by the teacher's community of the country. The local sector of the KISSEL server is freely used for any domestic purposes. Some of the local contents which are worth sharing between countries are translated into English and are put into the international sector, which are automatically copied to any KISSEL servers of the different countries. In such ways, the local (domestic) activities of teacher of producing teaching materials is extended and integrated into the international cooperation on the KISSEL platform. Namely, teacher's daily activities by using domestic language are the seeds of international cooperation to improve their education method. As the result of this data sharing, the networks between teacher's communities in Asian Pacific counties are naturally produced. Through this cooperative activity, new sciences and technologies are digested locally or optimized to the region. This process is very important because direct application of the knowledge and techniques of developed countries do not work in the developing countries.



Figure 13.6. Data sharing between teachers' communities by using KISSEL

4.2. Optimization of timing of data transfer

The contents in the international sector of KISSEL servers in different countries should always be the same. In order to do this, a sophisticated contents synchronization method has been developed. The synchronization is carried out in such a way that when a new content is uploaded into the international sector of a local KISSEL server, it is firstly copied to the KISSEL server in Japan and then it is further copied to the other local KISSEL servers of all the other member countries. Namely, the KISSEL server in Japan works as a "hub" server. In order to make the synchronization process efficient, we must have optimization of the timing of the data transfer. As seen in Figure 13.5, there are time slots in which the campus network is not very busy. Since data transfer speed

depends also on the state of the Internet pathway, we carried out measurements of the time variation of the speed of data transfer between Japan and KISSEL member countries. Figures 7(a) show the measured result of the daily basis variation of the transfer speed for uploading and downloading from the hub server to the other KISSEL server settled in the same campus LAN. The campus LAN has enough bandwidth (Note the unit is Mbps, while in Figs. 7(b) and 7(c), the unit is Kbps). Although the data transfer rate has a little fluctuation but the mean value does not depend on time. The time scale is presented by Greenwich Mean Time. Note the data transfer is inside of the campus LAN and is not influenced by the state of the Internet. Figure 13.7(b) shows the result of similar measurement of the data transfer rate between the KISSEL server in Japan and that in Sri Lanka. Figure 13.7(c) shows the result of measurement between the KISSEL server in Japan and that in Vietnam.

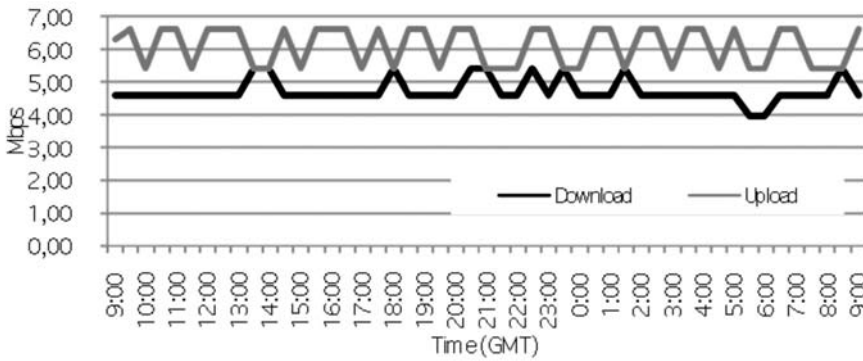


Figure 13.7(a). Data transfer speed between the hub server and another KISSEL server settled in the same campus LAN

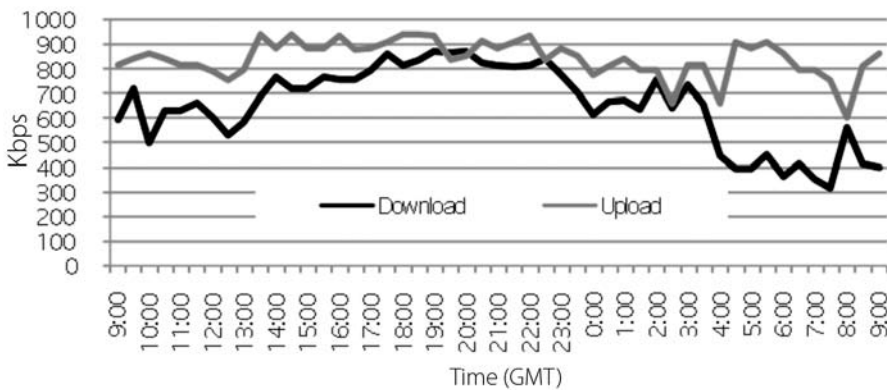


Figure 13.7(b). Data transfer speed between the hub server in Japan and a local KISSEL server in Sri Lanka

The timing of the synchronization should be decided on the basis of the traffic data in the LAN where the local KISSEL server is settled and data transfer speed

between the hub server in Japan and the local KISSEL server in the member countries so that the best synchronization speed is obtained without giving harmful effect on the performance of the campus LAN. The suitable time slot is a period between 19:00 and 22:00 (GMT) for the data transfer between Japan and Sri Lanka. And it is a period between 15:00 and 18:00 (GMT) in the case of data transfer between Japan and Vietnam.

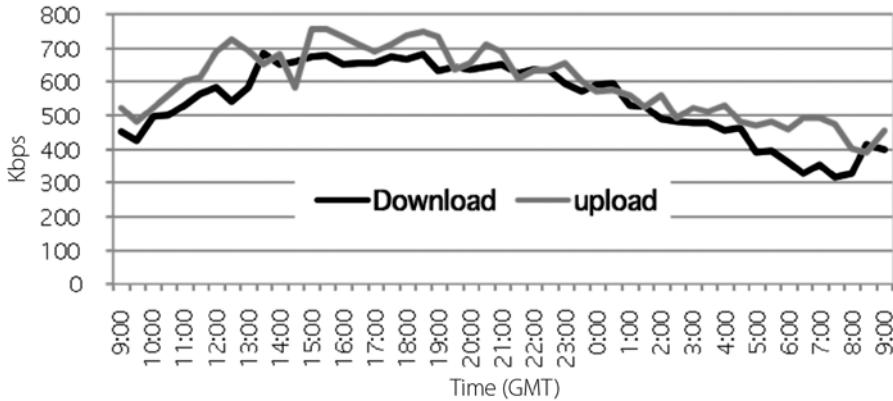


Figure 13.7(c). Data transfer speed between the hub server in Japan and a local KISSEL server in Vietnam

4.3. System and user management

To keep the security of the system, a membership method is adopted for the user management. The users of KISSEL are classified into 5 categories depending on their contribution to the project. Figure 13.8 shows the hierarchy of KISSEL users. The top level (Level 1) user is called “super administrator” who works for the management of the total system of KISSEL. Especially, he contents synchronization process between the KISSEL servers. The Level 2 user is “local administrator” who is responsible for the management of user and contents of local sector of the local KISSEL server of the country. The local administrator can delete contents and users of the local server. The Level 3 user is “editor” whose works are (1) uploading new contents to the local sector, (2) monitoring of contents in the local sector, (3) giving advices to the local administrator to remove ill or harmful contents, and (4) selecting valuable contents in the local sector which is worth sharing internationally and giving recommendation of such contents to the local administrator. The Level 4 user is “registered user” who is a regular member of KISSEL. The registered user can download any contents in the local sector of KISSEL as well as the contents in the international sector. Any people who are willing to joint to the KISSEL project can be a registered user. The registration can be started just by clicking “Create new account” on the KISSEL web page. Only restriction forced on the registered user is that the downloaded data must be used only for academic purposes not for the any commercial activities. The Level 5 user is “guest user” (non-registered user) who can browse only the abstract of the KISSEL contents.

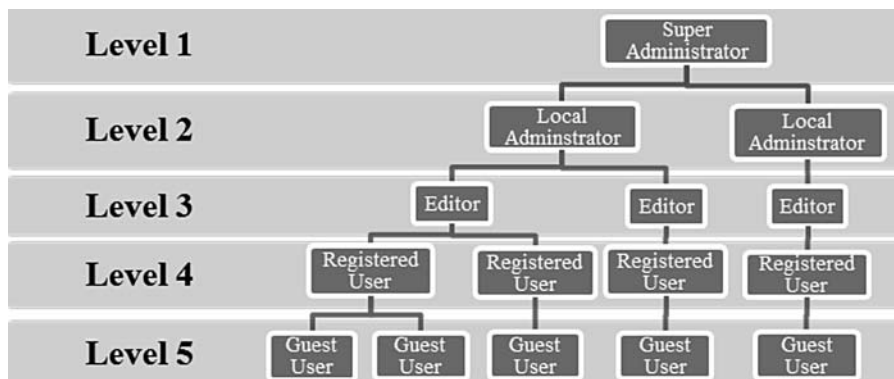


Figure 13.8. The categories of KISSEL users

Figure 13.9. The home page of KISSEL web site

4.4. Examples of KISSEL contents

The contents in the international sector of KISSEL, as well as those in the local sector will change in time frequently if the project is successfully carried out. But it is not so at present because the rate of uploading new data is rather low. The most of the new

data is coming from Japan. As the result, the overall data flow in the KISSEL group is mainly from Japan to the other member countries. This is not what we wanted. It is noted that activities in local KISSEL servers or activities in every KISSEL member countries should be more activated in producing new contents.

Figures 9 and 10 show the home page and the learning resources page of KISSEL web site, respectively. At present, the contents in the international sector is categorized into (1) E-learning, (2) Disaster management, (3) Sustainability sciences, (4) Technical notes, (5) Computer programming, and (6) Daisy library. These categories are decided in relation to the present status of research cooperation of producing contents. It is possible to add new categories when they are needed to carry out new cooperation of contents production. Under these 6 categories, there are lots of titled contents, each of which is composed of an abstract and various kinds of attached files and their brief explanations. Any guest user can read the abstract. To see the inside of the attached files, it is needed to be a registered user.

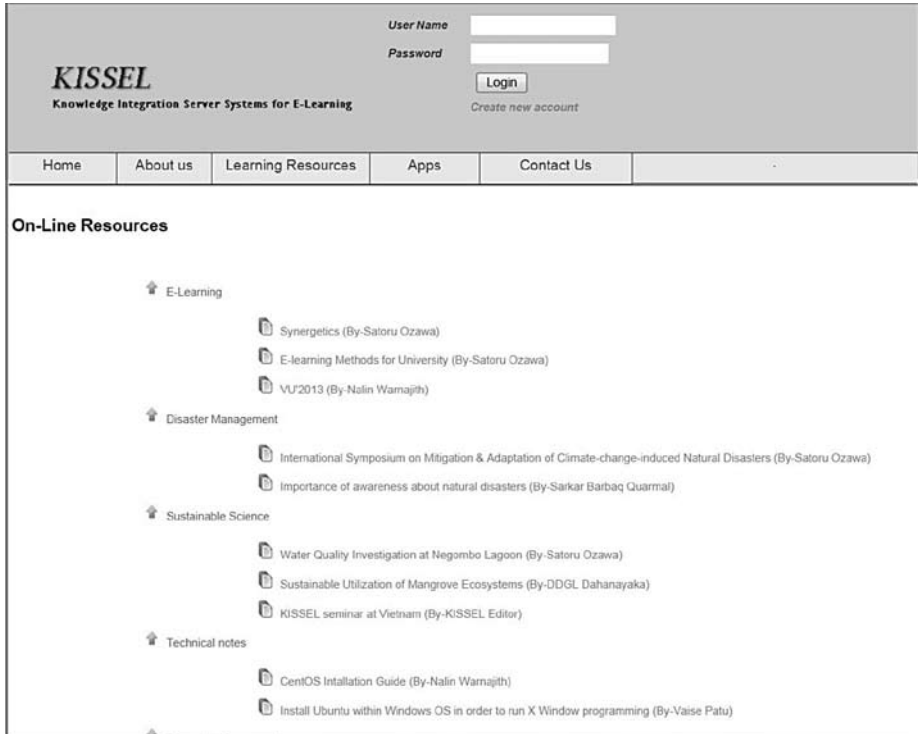


Figure 13.10. The learning resources page of KISSEL web site

Now, let us see some examples of the titled contents:

- Title: E-learning method for university.
This is classified into the category of “E-learning”. It is a video record of Prof. Ozawa’s lecture at University of Labor and Social Affairs, Hanoi, Vietnam in

- March 2007. The title of the lecture is “The Use of E-learning Methods for University Activities – Role of Teacher’s Communities in Asian Pacific Countries for Improving Teaching Methods by E-learning Techniques –”. The attached files are a video file of the wmv format (462MB) and sides file of the pp format (85MB).
- Title: International symposium on mitigation and adaptation of climate-change-induced natural disasters
This material is classified into the category of “Disaster management”. It is video records of lectures at the international symposium at Hue, Vietnam, 2007. Each video has a subtitle and its volume is about 500MB. The examples of subtitle are, “Sea level change in the coastal zone of Vietnam and related geohazards”, “Global warming simulation by using high-resolution climate model”, “The new Orleans levee failures in Hurricane Katrina: assessment and discussion”, etc.
 - Title: Sustainable utilization of mangrove ecosystems
This is classified into the category of “Sustainability Science”. It is a document of pdf format of the size, 12MB. Mangrove in Sri Lanka is explained with many photos and illustrations.
 - Title: CentOS installation guide
This is classified into the category of “Technical notes”. It is a document of pdf format of the size, 669KB. It is explained how to install one of the most popular Linux operation system, CentOS into your computer.
 - Title: Introduction of C and X Window Programming
This is classified into the category of “Computer programming”. It is a copy of Preface and Chapter 1 of the book “Introduction of C and X Window Programming - Guiding Very Beginners to Developer Level -” by Satoru Ozawa, Md. Mahbulul Alam Joarder, Gamunu Dassanayake and Vaise Patu, Godage International Publishers (Pvt) Ltd. Colombo, Sri Lanka, 2009. This material is given in the form of pdf format of the size, 955KB.
 - Title: Hotcakes make you happy
This is classified into the category of “Daisy library”. It is used for learning Japanese and English. “Daisy library” is a collection of language learning materials of the Daisy format¹⁵, which was developed by Ritsdaisy project of Ritsumeikan University, Kyoto¹⁶. It is a special category that has 6 subcategories: (1) English-Japanese Daisy Library, (2) Chinese-Japanese Daisy Library, (3) Spanish-Japanese Daisy Library, (4) Portuguese-Japanese Daisy Library, (5) Tagalog-Japanese Daisy Library, and (6) Japanese Daisy Library. Each subcategory has about 25 titled contents.

Conclusion

The people of developing countries import new sciences or technologies from developed countries. The imported knowledge sometimes does not work in its original form in the environment of developing countries. Therefore, digestion or adaption of knowledge in developing countries is important. The KISSEL provides an international platform for realizing best suited knowledge sharing environment in Asia Pacific

countries. The KISSEL is a knowledge integration servers system for the communities of teachers in Asian Pacific countries. The knowledge integration in the KISSEL servers is carried out in cooperation of the teachers in this region. The data transfer between the KISSEL servers settled in KISSEL member countries is carried out during the optimized time periods in a day so that it does not affect the local bandwidth of the countries. The local user can download the data directly from the local server in rather short download time. Thus, the KISSEL servers work as “cash servers”. It can be said that the KISSEL is a best suited knowledge sharing system in the developing countries. The method of the knowledge integration and the knowledge sharing is very democratic in character. Namely, the data flow is not top down but bottom up. They share knowledge by a “helping each other” method. Well digested knowledge is worth sharing for them. It should be noted, however, that the method can work not only in Asian Pacific region but also anywhere in the world if people can have a common interest and an intention of collaboration for knowledge sharing. The reason why we restricted to Asian Pacific region in the beginning stage of the KISSEL project was that the people in this area have similar natural and socioeconomic backgrounds and the knowledge to be shared becomes automatically similar. At the present stage of the project, we are thinking this restriction is not so important. The project should be extended to any other area of the globe.

Acknowledgement

In the initial stage of this project, it was carried out under the umbrella of the two project organizations, ICAS and IR3S which were supported by the Ministry of Education, Culture, Sports, Science and Technology, Japan. The part of this work has been supported also by Grand-in-Aid for Scientific Research (C) 2008 No.205008250001, (B) 2012 No.24300278, and 2012 No.24650124. The author express sincere thanks to Dr. Gamunu Dassanayake, Dr. Vaise Patu, Ms. Edna Temese, Mr. Alno Ualesi and Dr. Sarkar Barbaq Quarmal who contributed to this work as doctoral course students of Ibaraki University, and to Prof. Md. Mahbulul Alam Joarder of the University of Dhaka for his valuable comments. Author’s thanks are also to Profs. Lech Banachowski and Mitsuhiko Toho of Polish Japanese Institute of Information Technology, Warszawa, Prof. Wataru Ozawa of Ritsumeikan University, Kyoto, and Prof. Tran Triet of University of Science – Ho Chi Minh City, who are interested in the cooperation for the contents development on the platform of KISSEL.

Reference

1. Nalin Warnajith, Sarkar Barbaq Quarmal, Masanori Itaba, Atsushi Minato and Satoru Ozawa, Formation of Knowledge Sharing System for Asia-Pacific Countries by Using Modern Information Techniques, *International Journal of Computational Engineering Research*, 2/7, pp 204–211, January 2013.

2. N. Warnajith, G. Dassanayaka, D.D.G.L. Dahanayaka, S. B. Quarml, V. Patu, A. Minato, S. Ozawa, Effective data synchronization process based on KISSEL, Proc. of the 7th International Student Conference at Ibaraki University (ISCIU7), P-049, 2011.
3. N. Warnajith, G. Dassanayake, D.D.G.L. Dahanayaka, A. Minato, S. Ozawa, Development of Data Managing System in Common with Moodle and Xoops, Proc. of the 6th Int. Students Conf. at Ibaraki Univ., 57–58, 2010.
4. Dassanayake, G. ; *Development of user communities of E-learning & risk management in South Asian countries by installing cooperative servers*, Ph.D thesis, Ibaraki University, 2008.
5. Ozawa, S. , Dassanayake G., Patu V., Tonooka H., Noguchi H., Minato A., and Karunathilake K.; *Development of Social Networks for Education of Risk Managements of Natural Disasters in Asian Pacific Countries*, Proc. Intern. Conf. on Social Sciences, pp. 187–193, 2008.
6. Ozawa, S., Dassanayake, G., Patu, V., Noguchi, H. and Minato, A. ; *Role of teacher's communities for improving teaching methods by E-learning techniques in Asian Pacific countries*, Proc. 8th ITHET2007 Kumamoto, pp.342–346, 2007.
7. Dassanayake, G., Patu, V., Fernando, S., Jayasekera, R. , Minato, A. , Noguchi, H. and Ozawa, S.; *Improvement of text-based E-learning contents by using a new multimedia-type web authoring tool in the case of a Sri Lankan university*, Proc. 8th ITHET2007 Kumamoto, pp.552–556, 2007.
8. Dassanayake, G., Patu, V., Fernando, S., Nandadeva, B. D., Somaratne, R., Minato, A. , Noguchi, H. and Ozawa, S.; *Problems in introducing web-based learning in South Asian countries*, Proc. 8th ITHET2007 Kumamoto, pp.325–329, 2007.
9. Fuse, M., Miura, S., Nishiyama, K., Suzuki, M., Nemoto, N. and Ozawa, S.; *Development of E-learning system by using portable video game machines as mobile terminals*, Proc. 8th ITHET2007 Kumamoto, pp.268–272, 2007.
10. Fuse, M., Waga, T., Suzuki, M., Nemoto, N. and Ozawa, S.; *Application of high definition video techniques for obtaining high quality video on demand contents*, Proc. 8th ITHET2007 Kumamoto, pp.304–308, 2007.
11. Patu, V., Dassanayake, G., Noguchi, H., Minato, A. and Ozawa, S.; *Development of E-learning user communities by installing cooperative servers*, Proc. 8th ITHET2007 Kumamoto, pp.472–476, 2007.
12. Fernando, S., Warnajith, N., Dalugama, J., Jayasekera, R. , Dassanayake, G., Patu, V., Minato, A. and Ozawa, S.; *Development of a Job Control System to Optimize Web Traffics*, , Proc. 8th ITHET2007 Kumamoto, pp.455–459, 2007
13. Fuse, M., Ozawa, S., et al.; *Development of Multimedia Database for an Introductory course of Information Technology*, Proc. IASTED Intern. Conf. Computer and Advanced Technology in Education, pp. 295–299, 2003.

14. Charles Kadushin; *Introduction to Social Network Theory*, http://www.meshforum.org/archives/network-discussion/charles_kadushin_intro_to_social_network_theory.html, and a number of references therein.
15. DAISY Consortium, <http://www.daisy.org/>
16. Ritsumeikan Univ. DAISY Association, <http://rits-daisy.com/>